1859 PUBLISHED WEEKLY 1920

AMERICAN GAS ENGINEERING JOURNAL

FORMERLY

AMERICAN GAS LIGHT JOURNAL

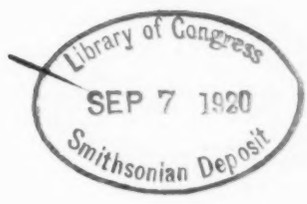
VOL. CXIII., No. 10
WHOLE No. 3261

NEW YORK, SATURDAY, SEPTEMBER 4, 1920

Subscription $3 per year
$4 Canada $5 Foreign

GLOVER-WEST

VERTICAL RETORTS



The West Gas Improvement Co. of America

150 Nassau Street NEW YORK

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REQUIRE-MENT *vs.* ACCOMPLISH-MENT

The world progresses. What was considered luxury yesterday becomes a necessity to-day. No longer are horses the necessity and automobiles the luxury. Time saving seems to be the predominant factor. Take hot water supply, for instance. No longer does mere "automatic" hot water supply suffice. It must be automatic supply combined with fast flow hot water service. The public is impatient and wants hot water not only automatically and instantaneously, but quickly as well.	PUBLIC	KOMPAK Automatic Water Heaters furnish hot water automatically, instantaneously, and quickly. They furnish hot water as fast as the cold water flows.
Gas companies are in business to serve the public and to make money. A business axiom is, Large sales, small investment, big profit. It is clear that the more gas you can get your original mains to deliver the bigger will be the profit. A horizontal 24-hour curve across the top of your peak-load chart would represent a 100 per cent return on your investment. To attain such a condition is the dream of every gas company.	GAS CO.	KOMPAK Automatic Water Heaters have a small rate long hour burning gas consumption. They are used every day of the year, making KOMPAK the ideal gas appliance for getting more revenue from your original equipment. Incidentally, a KOMPAK can be connected to the original house meter and piping, saving the cost of extra meters and services.
The public and the gas companies demand an appliance equipped with all modern improvements.	BOTH	The KOMPAK Automatic Water Heater is equipped with an automatic pilot which automatically shuts off all gas to the heater should the pilot go out.

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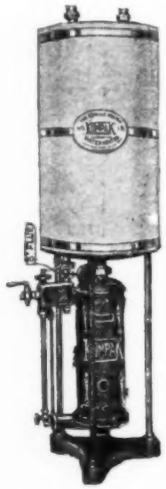

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AUTOMATIC STORAGE WATER HEATERS

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AMERICAN GAS ENGINEERING JOURNAL. Sept. 4, 1920. Vol. CXIII, No. 10. Published Weekly by American Gas Light Journal, Inc., New York, N. Y. Subscription Price $3 per Year; $4 Canada; $5 Foreign.
Entered as second-class matter January 9, 1917, at the post-office at New York, N. Y., under the Act of March 3, 1879.

Library of Congress
SEP 7 1920
Smithsonian Deposit

American
Gas Engineering Journal

FORMERLY THE AMERICAN GAS LIGHT JOURNAL

Vol. CXIII, No. 10 NEW YORK, SEPTEMBER 4, 1920 Whole No. 3261

Gas and the Composition and Treatment of Alloys and Eutectics

Deoxidizing—Adoption of Blast Burner Brings Aluminum Within Range of Gas Furnace

By GILBERT C. SHADWELL

In a recent article on the subject of gas in connection with the treatment of alloys, a detailed consideration was given to the composition of bronzes and other eutectics and alloys. It is proposed to consider others at the present time and to deal with certain phases of the handling of them, such as the care of various alloys, bronzes, white metal, stereotype metal, and so forth.

Gas is used to-day for the purpose of metal melting to an extent scarcely dreamed of a decade or so ago. But the amount carried out is probably but a small fraction of that which may be done in the future. There now are furnaces on the market which handle almost any reasonable range of quantity of metal—especially in the case of the soft or low fusion metals. These furnaces are arranged so that the metal can be pumped out, ladled out or poured from a bottom outlet. They are in every sense practical. Incidentally, while on this point, the writer may perhaps be permitted to digress for a few words.

It is the practical side of things that normally counts most.

To be practical we must be consistent.

The barber who sterilizes his hair brushes, combs, razors and shaving brushes, but who applies a soft powder brush to your face that he has used on the faces of hundreds of other customers is inconsistent and he is not truly practical.

We, as gas men, would do well to bear this point constantly in mind. It is all-important.

The gas salesman who spends many hours or even days, weeks or months in working up a prospect and who, after finally closing the sale, sends in his order incorrectly is inconsistent and the result is impractical.

Scores of orders are received by manufacturers which embody errors in either the name or number of the appliance or the price.

This would never occur if the salesman's catalogue were kept up to date or if he exercised that same care that he gave to the customer.

Whether it is the salesman or the purchasing agent who is at fault in such cases is relatively unimportant. The result is the same—needless correspondence or wrong shipments, both involving endless delay.

Applying this to furnaces in particular. It is not uncommon to find furnaces called pots or pots named furnaces. Freight rate, crating, trucking, are all serious items to-day, and an error in description may double the cost of these items if the wrong goods be sent to fill an erroneous order.

Use of the Soft Metal Furnace

It is hoped the reader will pardon the short digression made in our subject, but it is felt that it will assist many who would follow the subject through to its conclusion.

As to the use of metal melting furnaces we need say little, as the subject has been treated at some length already. For those who may desire data on the subject, however, a short recapitulation will be made later.

For the present it is proposed to say a few words concerning the subject of deoxidation. As is known, all metals tend to oxidize or form "dross" when heated in the presence of air or oxygen, and not only is this oxide visible on the top in the form of a "scum" but it also tends to form around every particle of the component metals which go to make up the alloy. This layer or series of layers may be but a very small fraction of a millimeter in thickness and the weight per cubic centimeter of metal may be infinitesimal, but it causes sluggishness in the flow when the alloy is poured as well as giving an unevenness when the metal is cast, so far as its surface next to the mold is concerned. It therefore does not give so clean or sharp a cast as new or deoxidized metal would. For this reason I give the following for which I am indebted to the Metals Deoxidizing-Refining Company of New York, as I believe it will prove of particular interest.

Deoxidizing Liquation

When a mixture of metals is gradually heated to a temperature sufficient only to melt the most fusible constituent present, the easily fusible parts flow away and leave the more infusible parts behind.

This is a simple statement of the ancient method of liquation, which has been employed for centuries in the refining of lead, tin and other soft metals. In modern practice, this method, usually characterized as "sweating," is largely used in refining secondary metals.

The literature goes back to the earliest records, but the practice has hardly changed one iota.

We date the great tidal wave of modern science, with its applications to chemistry, physics and metallurgy, from the sixties of the last century. Hence, literature of that time represents past history in distinction to the modern.

Crooks and Roehrig, writing in 1868, say: "The liquation process (is) chiefly used for separating the substances difficult to fuse (copper, nickel, iron, etc.), which are present in large quantities in lead; this process is conducted mostly on the liquation hearth, and, *though simple, is imperfect and causes great loss of metal.*"

Associated with hearth liquation is the subsequent operation in the kettle, which we usually term "boiling," and which consists in submerging beneath the surface of the molten metal a hard wood pole or block of wood or other carbonaceous material, such as potatoes; sometimes powdered charcoal or rosin are puddled into the metal. This effects the final separation of the hard metals and infusible impurities and completes the refining.

Quoting again from Crooks and Roehrig, 1868: "When smelting (melting) at as low a temperature as possible, iron, zinc and copper separate almost entirely from the lead, and swim on its surface as a pasty, half-melted mass, provided the crust is repeatedly skimmed off. . . . This mode of purification is sometimes assisted by mixing wood shavings and brush wood, etc., with the molten lead, and stirring it up with them, when a development of gases will take place, causing mechanically mixed impurities to rise to the surface."

Then, again, they describe, "The process of stirring the smelted lead with a birch pole. . . . A birch pole is moved about in the melted metal bath by machinery for two hours; by this manipulation the metal begins to bubble fiercely, the surface is continually renewed, and an ample separation of impurities is effected, which are removed in pierced ladles."

This was then and had always been the practice in the Hartz Mountains, and this method, so clearly described, is to-day, with only slight modification, the practice in almost all soft metal works in America.

Hearth liquation, or sweating, undoubtedly, "though simple, is imperfect and causes great loss of metal." The use of fuel is excessive, large surfaces of metal are exposed to reoxidation and thrown back into dross, and most serious of all, small particles of hard metal are washed out and floated away in the stream of soft metal; the separation is imperfect.

This long review of the art seemed necessary to the writer, as it has a direct bearing on the Knox Process of Deoxidizing-Refining and helps to make it more easily understood.

It has been said that when the history of the metallurgy of the last twenty years comes to be written it can be summed up in the word "deoxidation." We are all familiar with the use of metal and metalloid deoxidizers, such as silicon, aluminum, vanadium, titanium, boron and phosphorus. They make the metal more fluid, more homogeneous, clean it and make it sounder.

When metals are melted or held for some time in a molten condition in contact with the atmosphere, they become thick and sluggish; they lose in fluidity and inclusions of foreign matter do not separate out and rise to surface. Add a small amount of a deoxidizing agent to the molten metal and it becomes instantly highly fluid, included matter tends to come to the surface, and the metal becomes clean and homogeneous.

However, such solid deoxidizers can only be used in very pure metals and at the time of pouring. If after adding the deoxidizer the metal is held in the molten condition, the deoxidizer will be destroyed by oxidation and the metal will revert to its sluggish condition. Also greater care must be used in judging the quantity required as any excess forms an undersirable alloy with the metal, and the products of the deoxidizer add impurities to the metal it is desired to purify.

This phenomenon of increased fluidity, caused by deoxidation, is remarkable, is even spectacular, and is directly related to the old methods of boiling. In boiling carbonaceous materials are used, hydro-carbon gases are evolved and the metal is deoxidized and rendered fluid.

The same amount of violent agitation of the molten metal by mechanical means without the presence of deoxidizing substances would have no cleaning or purifying effect. The fact that boiling, or liquation in the kettle, is a deoxidizing or reducing process seems to have entirely escaped notice until the advent of the present process.

This process in its simplest form consists in boiling molten metals with deoxidizing gases, such as carbon monoxide and hydrogen. The metal is quickly deoxidized, and by the continuing action of the process remains deoxidized; the metal is thus restored to and remains maintained in a condition of extreme fluidity; foreign matter, such as infusible inclusions, copper, iron and zinc, separate out and are carried to the surface by the boiling or levigating action of the gas; the gas itself escapes from the metal and carries with it the oxygen in combination, and no impurity is added to the metal by the deoxidizer. The time required is short, much shorter than by ordinary boiling, and no harm or loss ensues if long continued; the amount of gas is small—one hundred to two hundred feet of gas will refine thirty tons of metal.

To illustrate the liquation and refining by this method an actual case may be given:

Five tons of extremely refractory "hard metal" scrap was charged into a kettle and melted. An analysis could not be made, as it was not possible to sample so heterogeneous a mixture. A high temperature was first used so as to bring all the metallic constituents into molten admixture and to allow the cinder, broken brick and scoriae to rise to the surface. This dirty scum was carefully skimmed off with very little loss of metal. The gas was then turned on for an hour, using from one hundred to one hundred and fifty feet, and the fire allowed to cool down. At a temperature of approximately 650 deg. Fahr. a clean, crystalline, metallic crust, some three inches thick, was ladled off with skimmers into another kettle. The crust or hard layer was entirely clean metal and separated easily and completely from the very fluid bath beneath. This hard top crust analyzed as follows:

Tin, 5 per cent; antimony, 2.10 per cent; copper, 5.02 per cent; zinc, none; iron, trace; lead by difference, 87.88 per cent.

The hard alloy on account of its high purity was immediately available for making up into a standard Babbitt metal. The liquid bath contained not even a trace of copper, iron or zinc and was immediately available for making into a standard soft alloy.

If this metal had been sweated on the hearth as usual, there would have been a residue left on the hearth of all the dirt, scoriae and an increased amount of dross into which would be mixed the larger part of the ore

copper, iron and zinc. This would then be followed by a smelting operation to recover the contained metals. The soft liquated portion would have carried a large amount of entrained dirt and much of the hard metal; this soft metal would then have to be boiled by remelting and using wooden blocks, with another portion reverting to dross.

The new process gives clean metallic products of the highest degree of purity at one operation and produces a minimum of dross for re-treatment.

If the constituents of the impure metal are such as to require a preliminary oxidizing treatment, air may be used for boiling for a short time, the oxidized dross skimmed off, and then the deoxidizing boiling proceeded with, all in the same kettle and with the same heat, with the minimum of time.

Usually, if the amount of hard metal crust is small, it is best to skim it off by means of perforated skimmers into a second kettle. In some cases, the hard metal may be left in the original kettle and the soft alloy pumped from under it or drained off by a bottom tap.

If it is desired to make alloys containing some constituent in excess, that would tend to separate out in the kettle on standing, such as stereotype metal with an excess of antimony, or bearing metal with an excess of copper, or a copper tin alloy with an excess of lead, such mixtures can be kept in homogeneous admixture for any length of time while ladling by continuing the puddling or agitation with the gas. This agitation of the metal is beneath the surface except under the gas trap; the surface of the metal is unbroken, and very little drossing can take place. It is also advisable to continue the use of the gas at a diminished rate during the whole time that the metal is in the molten condition.

The operation of the process is entirely automatic, with the exception of the turning on or off of the gas by means of a single cock.

In regard to the history of deoxidizers it is notable that the practice has been almost entirely empirical. The practical metal man has found that the use of certain substances has given him a cleaner and sounder metal without knowing the reason why. This has attracted the notice of the engineer and chemist who have added other deoxidizers to the list until the time has now arrived when the following system has been evolved.

The first deoxidizer was a stick of wood. This is still used in refining copper and tin on a large scale. It is known as poling or boiling. The organic gases bubble up through the metal and reduce the oxides, but the reducing action is feeble on account of the counteracting effect of the large amount of water vapor. Moreover the time required is excessive. Often in cleaning tin and stereotype metal, etc., potatoes are used and sometimes powdered charcoal or rosin are employed with the addition of sal ammoniac. They bare all deoxidizers to a certain degree but they are usually called "fluxes."

Modern scientific deoxidizers or fluxes are metalloids with a very high combining action for oxygen but it is impossible to secure complete deoxidization without adding somewhat of an excess of the deoxidizer and this excess combines with the metal and alters its properties. Such metals and metalloids are phosphorus, silicon, aluminum, magnesium, boron, etc.

The process uses gas as the deoxidizer. Preferably a gas rich in hydrogen and carbon-monoxide. In this process it is compressed and forced to the bottom of the molten metal and allowed to bubble up through it. It thus comes into very intimate contact with every part of the fluid metal. It unites with the oxygen in the metal and carries it out in the metal in the gaseous form as water vapor and carbon dioxide. Its great value is that it can be used in excess as it will not contaminate the metal in any way. This process, which is patented and is in use in some of the largest newspaper and metal working corporations in the United States, is growing rapidly in its application.

In the white metal trades such as tin dipping, coating metals, casting stereotype plates, etc., it is not only necessary to deoxidize and clean the metal but if possible to maintain the metal bath continuously in a deoxidized and clean condition. Deoxidizing and refining is carried on continuously during the whole period of the operation as new metal can be added and old metal removed either continuously or intimately while the bath is being cleaned and deoxidized. Whereas the old way the metal is cleaned in fluid after fluxing or deoxodizing but rapidly becomes dirty and sluggish until it is again cleaned.

This patented apparatus is automatic. It consists of a rotary gas compressor motor driven and automatically controlled. The compressor unit is always in operative condition. When gas is allowed to pass through the metal the gas pressure gradually falls to a predetermined lower point. When this point is reached the motor is automatically started. As soon as the predetermined higher pressure is reached the motor is automatically stopped. At the metal pot a pipe passes to the bottom of the molten metal and the amount of gas is regulated by means of a needle valve or plug with a restricted opening. Above the outlet of the gas in the metal is placed an inverted pot or bell whose edges are submerged in the molten metal. The rising gas is caught under this trap and conducted to a burner either in the fire box or above the metal. Another advantage of the inverted trap is that the boiling action is restricted to the area beneath the pot and the surface of the metal in the remainder of the pot remains quiescent and the natural dross and dirt accumulating on this surface remains undisturbed and protects the metal from oxidization.

The main advantages of the process are:

1. The deoxidizing agent can be used freely and in excess without injuring the metal.
2. The process is continuous.
3. It is clean and automatic.
4. The personal factor is entirely eliminated—no one has to clean the metal. It is always clean.
5. The metal is at all times in a highly fluid condition to *continuous* deoxidizing.
6. The metal needs very little toning. There is a saving in metal.
7. The amount of dross is greatly diminished, approximating 50 per cent of ordinary practice. This dross is dry and free from metal.
8. The puddling of the metal is vigorous and continuous. A very little gas will do the work. One cubic foot per minute is a liberal amount.

In addition to the foregoing, the writer has been fortunate in securing from the United American Metals Corporation of Brooklyn a short memorandum on the care of low-fusion metals.

While this is written principally for the stereotyper in relation to the care of stereotype metal, yet it applies with equal force to the handling of any of the soft or low-fusion metals or their alloys and eutectics:

The Care of Stereotype Metal

Some time ago I noticed that the more a metal pot was stirred, the greater the amount of dross that was formed. Knowing that the prime reason for stirring is to produce a further mixing of the metal's ingredients, I started to study the cause and principle of separation. First to learn if stirring was actually necessary, and second to see if it produced a change in the metal which would cause it to give improved results.

Testing the Principle

I had made a kettle which was tall and deep and from top to bottom of this pot, placed outlets and valves at regular intervals of a few inches. The object of these outlets was to permit of drawing metal from any desired level of the mixture at will.

With this equipment I could allow liquid metal to remain for any desired length of time in the test kettle and study, test and check the contents of samples of separated metal as drawn from the several outlets at different levels. With a delicate metal worker's gravity scale, these samples could be quickly and accurately checked for variations. Variations could later be confirmed by chemistry where desired.

If the ingredients separate, the separation will take place while the metal is liquid. The lead will sink to the kettle's bottom by gravity because it is the heaviest of the three ingredients, the tin will be the central layer and antimony, which is the lightest ingredient, will float at the top.

Results of the Test

The tests were slowly and carefully conducted and the results of them are worth the careful consideration and adoption of consumers of metals such as stereotype.

I found by these tests that some grades of type metals separate so seriously as to cause annoyance in practical work. I found also that by taking those same alloys which separated out of the kettle, placing them into a suitable mixing pot and giving them thorough treatment, and then again placing them under observation in the test kettle, that this separation would cease. That they would unquestionably be converted, by using the proper process of alloying, into practically non-separating metals.

The tests showed that while some alloys would separate, a perfectly constructed alloy of stereotype formula would be practically proof against separation.

Depends on the Metal

I believe that the stirring of your kettle and its attendant manufacture of excess dross waste depends upon no fundamental ungovernable principle but instead, depends upon what kind of metal is in your pot. Some metals require stirring and some do not. I advise each and every stereotyper to stir his metal only when it needs it. Not before and no oftener. There are two guides.

No. 1. Watch the quality of work and if it becomes under standard, then give the metal a good stirring. Stir from the bottom upward and avoid causing an excessive and needless boiling and splashing of the metal. Use a skimmer for stirring when practical as forcing metal through the holes in the skimmer increases the mixing effect.

No. 2. Select your stereotype metal with extreme care. Try to eliminate the use and acceptance of any old kind of metal whose chief recommendation was its price per pound. Insist upon metal which you have confidence in. Get the best metal into your pot and then treat it right. Take care of it. It is a subject hard to understand but worth understanding. Study it. The more you know about metal, the better will you enjoy working with it. Don't fight it but master it and make it serve you. Another thing. Show the business manager of your plant that his interests and yours, in this regard, are identical. Make him take interest in your study of metal and eventually you will be able to prove by cost sheets that using the best metal in the right way will reduce your troubles, produce better results and save the publisher money in the long run. The best of metal will not require much stirring.

Shrinks and Porous Plates—Some Causes and Remedies

When performing a service job where the trouble consists of shrinks or porous plates, usually my first procedure is to thoroughly examine and test the metal. If I find it, in quality and construction, such that it should be delivering fair results in satisfactory manner, then I begin to search for other causes of the trouble and have had cases, where, after these causes had been hunted down and removed, the metal worked up to standard.

No Two Boxes Alike

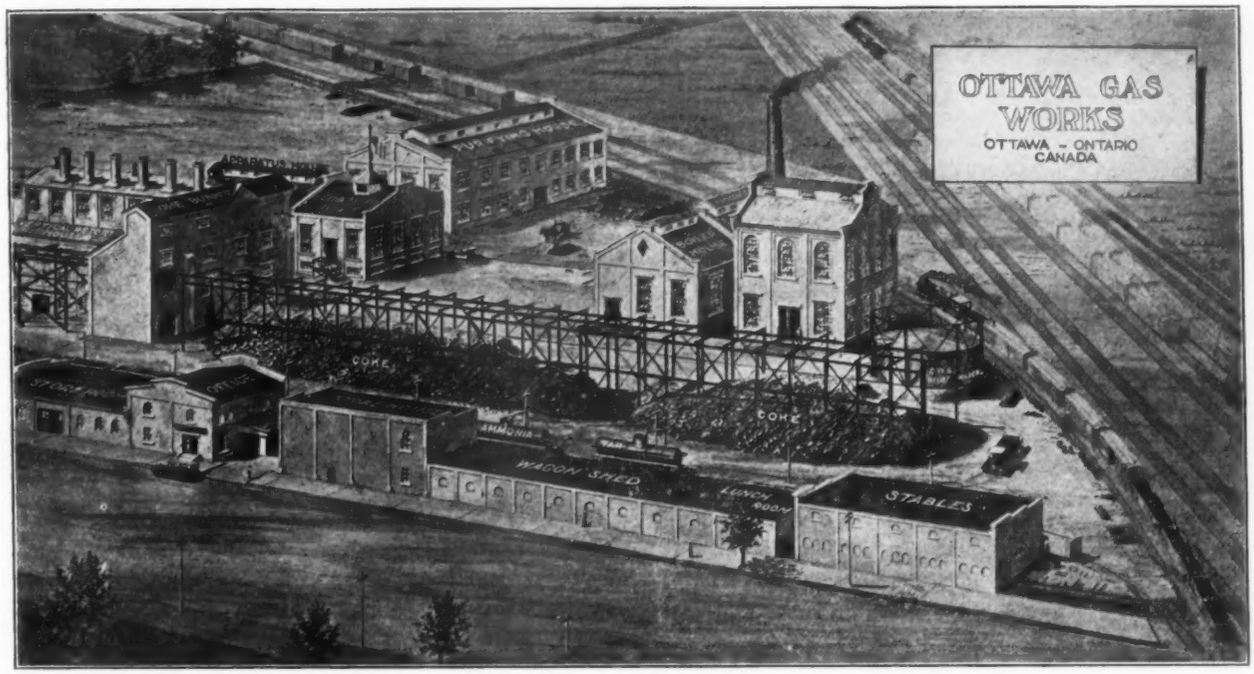
If casting boxes were identical there would not be much delay in running down ordinary trouble, but unfortunately there is a variation in casting boxes. The density, solidity and tightness of the iron in the cast box depends upon what temperature the iron was when it was cast, the construction of the mold, the kind of iron used and its purity. And it is thus safe to assume that no two boxes are identical in all of these respects.

The solidity of the iron in the box affects the ability of the metal as a conductor of heat and therefore no two boxes were exactly the same in their action of controlling the expansion and contraction of the liquid metal, which occurs in the plate as it is setting too solid. I have in mind a case of two casting boxes with the T spray cooling apparatus operated upon the same pot. One of these boxes would cast well and the other cast shrinks. After opening the box casting the shrinks and enlarging the spray holes from 1/16 in. to 1/4 in. in diameter, the box then cast with satisfaction. In this case the variation in the metal of the two boxes was such that one box required more water application than the other, before it would work under the conditions desired in that room.

Shrinks at the Top

Shrinks in ordinary boxes occur with most frequency at the top part of the plate. This is because the tail end of the plate has less weight of metal above it to prevent displacement by the action of shrinkage or contraction and also because, in casting, all the hot metal entering the plate passes the top end of the box and the temperature of both metal and box becomes warmer there than at the bottom of the box. This added heat further expands both the type metal and casting box.

(*Continued on page* 186.)



Carrying On by Means of Improved Plant Against Highly Adverse Conditions

A. A. Dion of the Ottawa Gas Company Attributes Ability of Company to Exist Largely to Modernity of Works

In common with all Canadian gas undertakings, the Ottawa Gas Company has had its share of anxieties due to increased prices for raw materials and labor, and while some financial relief can and will be obtained by increased gas rates, there is a point soon reached beyond which increased rates would be unprofitable owing to specially adverse local conditions. Thus with this company economical production is vital to its very existence. Our continued existence under these burdens is due in a large measure to the installation a few years ago of a new works with modern carbonizing and complete coal and coke handling plants.

This plant has enabled us with very much reduced labor to carbonize without difficulty all coals including the low-grade coals that we have been compelled to use lately and to obtain a yield of 16,000 cu. ft. per short ton, with a satisfactory yield of by-products, the coke being of very good quality and in such great favor that the demand always exceeds our production.

Ottawa is largely a residential city and gas is used chiefly for domestic cooking and water heating purposes. Although industrial installations are increasing, the most important being the Royal Mint and the Ottawa Car Manufacturing Company equipments, considerable auxiliary house heating is supplied and in a few cases complete house heating.

Two thousand gas ranges are now being added per year to our load which speaks well for the local reputation of gas as an efficient and economical fuel for cooking.

The increase in population of Ottawa, not including suburbs, has been as follows (according to our municipal assessment department):

1853	7,335
1876	25,214
1880	24,025
1890	43,122
1900	58,193
1919	107,732

Two tables are also given herewith showing the progress of the gas company's business during five-year period from which it will be seen that in 1914 the output of gas was 259,100,000 cu. ft. and in 1919, 421,814,000; an increase of 75 per cent, while the population increased about 33 per cent.

It will be of interest to note that with a make of 12,000 cu. ft. per ton of coal, which was the average during 1918, 37,651 tons of coal would have been required to produce the 1919 output, whereas the actual amount needed with the production of 16,000 cu. ft. was 28,238 tons, a difference of 9,413 tons.

The 4,000 cu. ft. per ton increase was obtained by passing additional steam into the retort and producing water gas there. The steam for this was generated mostly by coke breeze, with forced draft, a fuel material for which we never had any profitable outlet and the steam was therefore produced at little cost. In winter, owing to greater use of steam, it is necessary to use somewhat better fuel.

OTTAWA GAS WORKS, 1854-1915

The production of coke was affected naturally by the water gas, production being 63 per cent of the coal carbonized during 1918, and 58 per cent during 1919.

The tar yield increased from 10.76 gal. to 13.01 gal., and the ammonia yield increased from 3.58 to 5.03 lb.

We have a special peak load each year in September. It is the month of the Ottawa Fair, but the extra consumption due to the fair does not account for all this extra load. The actual consumption at the exhibit grounds amounts to only 209,200 cu. ft. Of course there is much additional consumption at hotels, restaurants, etc.

Experience has shown that comparison of the results from different works are of little value without an acquaintance with the conditions under which the plants are operated, and the arrangement of the works. A short description of the Ottawa Gas Company works might be of interest.

The site on which the works is built is a long triangular plot of ground containing approximately six acres, which has lent itself admirably to the construction of a modern gas works. A general view of the complete works is shown by one of the accompanying illustrations.

Retort Benches

The coal carbonizing plant consists of Glover-West Vertical retort benches which were erected by West's Gas Improvement Company in 1913-15. This system is well known and it is unnecessary to give any detailed description of the construction and operation in this paper.

The auxiliary plant and buildings were designed by Merryfield & Burnett, consulting engineers.

The coal carbonizing plant was designed for an ultimate capacity of 6,000,000 cu. ft. per day, in four self-contained units of 1,500,000 cu. ft. Only one of the units has been built, and provision has been made for adding the other units from time to time with minimum disturbance to the plant already in operation. In some of the equipment, where considerable ultimate saving was possible, the construction was made to cover two units.

Coal Handling Plant

Coal is delivered to the works in bottom dumping cars on the company's siding. A small electric locomotive is used to haul the car to a point over a sloping pit at the end of the coal store, the coal being directed to the inside of the coal store wall at that end. From this pit a Brown hoist man trolley telpher with grab bucket of one and one-half tons capacity raises and delivers the coal to any point inside the coal store or directly to the coal breaker.

One operator on the telpher working one shift per day usually handles all coal received into storage, takes coal to the breaker as required, and in addition handles surplus coke to the yard as is described below.

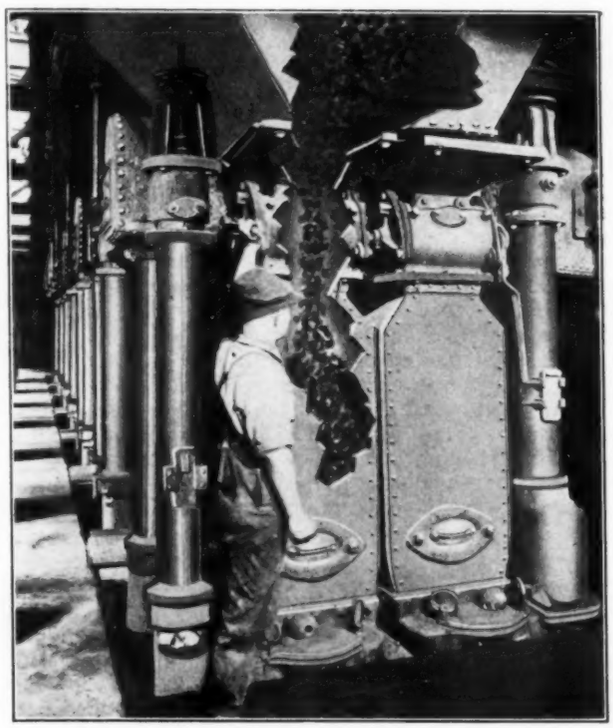
The coal required in the retort house is elevated from the breaker by gravity bucket conveyor which delivers it into storage bunkers above the retort bench.

An interesting detail of the coal handling equipment is that an extension of the telpher track is carried outside the coal store and over the railway tracks. During the winter months coal sometimes arrives with the contents of the car frozen, particularly the top section, thus preventing it from discharging through the hopper bottoms. In such cases the telpher bucket is run straight out from the store over the car which it unloads from the top, until the frozen portion of the coal is removed.

Coke Handling

The coke in the retorts falls by gravity through coke extractors into a "West" chain conveyor running in the floor to the end of the bench, where the coke falls into a cross conveyor and elevator of the gravity bucket type. This conveyor delivers the coke to several points as required. It fills a hopper above the bench to afford a supply for filling retorts after scurfing. It fills hopper, holding coke for the producer furnaces and conveys any remaining coke to a breaker and screening plant situated above coke storage hoppers adjoining the retort house. This breaker and screening plant sizes the coke and delivers it into three separate hoppers, one containing breeze, one containing small coke and the other large.

The coke is delivered direct from these points into wagons or trucks through proper chutes. Should a surplus of any of the three grades of coke accumulate, it is handled by the coal telpher bucket over a transfer track to an open air coke pile. This coke may be re-



PERIOLIC FILLING OF VERTICAL RETORT FEED HOPPER FROM OVERHEAD STORAGE

claimed when required, the telpher redelivering it to the coke hoppers, or it may be loaded directly into trucks or carts by means of a link belt electric wagon loader. With this system none of the coke produced is handled by hand; that which spreads into the yard at the bottom of the pile beyond the reach of the telpher grab is reclaimed through the wagon loader, as explained.

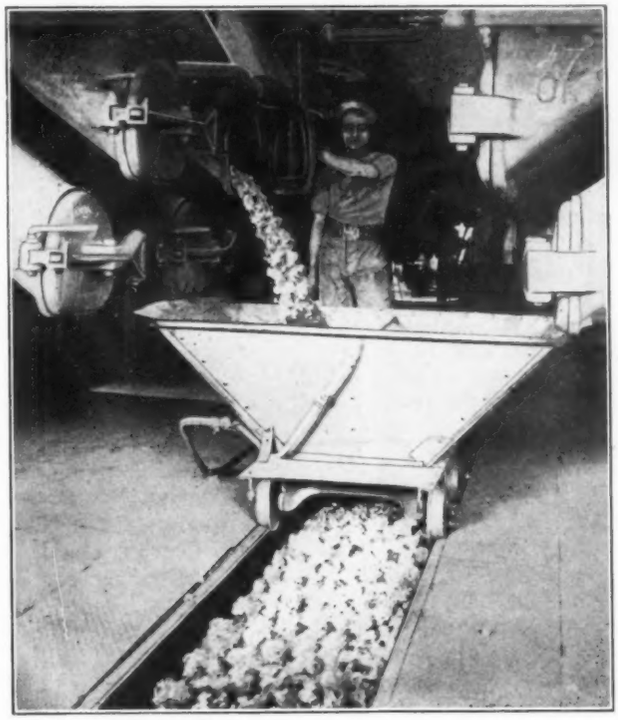
In the event of a breakdown to the gravity bucket conveyor normally handling the broken coal to the hoppers above the retort bench, it would be possible to utilize the coke bucket conveyor to tak its place. This coke conveyor would deliver the coal to side tipping wagons running on a narrow gauge track alongside the overhead coal bunkers.

All the coal and coke handling machinery is electrically driven except that extracting coke from retorts which has both steam and electrical drives.

Condensers, Washers and Exhausters

The condensers, washers and exhausters are installed in one house which is of solid brick construction with corrugated asbestos roofing. The equipment consists of a primary water tube condenser, duplicate exhausters of the Mackenzie Rotary type, one steam driven, the other electric driven; two secondary condensers; one Livesey type washer and one rotary scrubber washer. The latter is fitted so that several sections of the machine may be used as a naphthalene washer, should this be necessary. The condensers are fitted with automatic temperature controls, whereby the temperature of the outgoing gases may be automatically maintained at any desired degree.

The scrubber-washer is fitted with both electric and steam motive power, so that either may be used by simply operating a clutch.



RETORT DISCHARGE DELIVERING COKE, ALREADY COOLED, TO CONVEYOR

EXHAUSTER

In other respects the condensing scrubbing plant follows generally accepted lines, and is of a capacity of 1,500,000 cu. ft. per day. The building is arranged to accommodate additional units required for a second unit of one and one-half million cubic feet daily capacity.

Purifying House

The first installation of purifiers consists of four cast iron boxes in one block, each 25 ft. square by 10 ft. deep, fitted with trays of the usual type and "Milbourne" internal valves and connections with a capacity of 1,500,000 cu. ft. per day. These are accommodated in a solid brick building covered with asbestos roofing designed to accommodate purifiers to handle 3,000,000 cu. ft. of gas.

The oxide is elevated from ground floor to roof by means of an enclosed elevator and distributed to the purifiers by means of a spiral conveyor and canvas spouts—all electrically driven.

Meter House

The building is of solid brick with concrete roof covered with tar and gravel, and is of sufficient size to accommodate two meters of 1,500,000 cu. ft. capacity each.

The apparatus is of the usual type consisting of a rectangular station meter and an 18-in. station governor. This building contains main valves controlling the outgo of gas to mains.

A Sturtevant booster, steam turbine driven, capable of delivering 350,000 cu. ft. of gas per hour at 10-in. pressure will soon be available; the holder pressure being insufficient to give adequate full pressure during hours of maximum outgo.

Boiler and Ammonia Plant

These plants are installed under one roof, the building being of solid brick corrugated asbestos roofing.

The boiler house is of sufficient size to accommodate boilers for the ultimate capacity of 6,000,000 cu. ft. At present three 125 H. P. Robb boilers are installed.

The ammonia concentrating plant consists of a 42-in. Unger still with preheating arrangehent for the crude liquor, with all necessary strong and weak liquor tanks, etc.

Gas Holder

The storage gas holder is a three-lift steel holder having a total capacity of 1,500,000 cu. ft., and is erected

in a steel tank. Full provision is made to prevent freezing in coldest weather.

Water Gas Plant

The water gas generating plant building will accommodate two large sets of water gas apparatus, one of which has been installed, an 8 ft. 6 in. by 11 ft. 2 in. shell set of the Merrifield-Westcott-Pearson type, with electric driven direct connected blower.

The water gas plant was completed in 1919 as a possible auxiliary, but really as a spare emergency plant. It has been found invaluable during the past year in taking a considerable portion of the load when coal supplies were short.

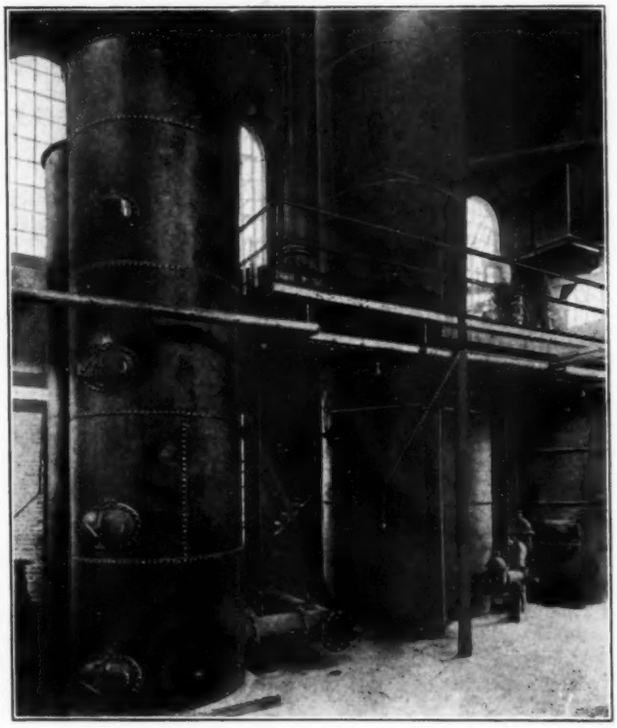
The relief holder is of 100,000 cu. ft. capacity, erected in a brick tank. This holder was formerly the top section of a storage holder at the old gas works, which was taken down and re-erected at the new works.

The water gas is metered in a 9 ft. diameter station meter, in the generator house. The carburetted water gas is taken to the exhauster house through a 12-in. main

Extensions to the telpher system are being considered whereby fuel for the boilers and water gas set will be delivered by the telpher operator—further reducing the cost of operating these plants.

It is a pleasure to say that, from all viewpoints, the installations of our vertical retort plant has throughout the past five years' operation, realized our expectations.

I am indebted to officials of our company for assistance in preparing this paper.



MERRIFIELD-WESTCOTT WATER GAS PLANT

Since Construction of New Works

	Output	Inc. %
1914—		
Year	259,110,200	7.43
Maximum day	850,800	2.81
Maximum month	23,496,100	5.26
Average day	709,891	7.43
1915—		
Year	261,963,519	1.10
Maximum day	876,100	2.97
Maximum month	24,722,345	5.22
Average day	717,708	1.10
1916—		
Year	281,641,000	8.65
Maximum day	7,078,000	23.04
Maximum month	27,362,900	10.68
Average day	779,838	8.65
1917—		
Year	342,502,000	20.32
Maximum day	1,174,000	8.91
Maximum month	32,521,000	18.85
Average day	938,362	20.32
1918—		
Year	407,892,000	10.09
Maximum day	1,491,000	27.00
Maximum month	38,681,000	18.94
Average day	1,117,000	19.09
1919—		
Year	451,814,000	10.76
Maximum day	1,642,000	10.12
Maximum month	44,996,000	15.31
Average day	1,237,840	10.76

Note—Outputs are expressed in cubic feet and increases in per cent of corresponding outputs of the previous year.

Increase in year's output from 1914 to 1919 = 74.37 per cent.

Increase in maximum day's output from 1914 to 1919 = 92.99 per cent.

Increase in maximum month's output from 1914 to 1919 = 91.50 per cent.

Five Years' Progress

	1914	1915	Inc. Per Cent	Dec. Per Cent
Gas manufacturing capacity (daily)	1,500,000	2,500,000	66.66	.....
Holder capacity	1,500,000	1,500,000	.....	.....
Miles of distribution main at end of each year	112.17 miles	143.6 miles	27.7	.....
Number of services in use at end of each year	7.315	14.544	98.824	.....
Number of meters in use at end of each year	11,394	17,995	57.9	.....
Number of gas ranges in use at end of each year	10,794	17,000	57.6	.....
Maximum net selling price of gas per 1,000 cu. ft. at end of year	112½	1.35 net	20	.....

American Gas Engineering Journal

SIXTY-FIRST YEAR

Published Weekly by AMERICAN GAS LIGHT JOURNAL, INC., 150 Nassau Street, New York, N. Y.

ELBERT P. CALLENDER, Pres. S. G. KRAKE, Vice-Pres. FREDERICK A. SOUTHWORTH, Sec'y-Treas.

EUGENE C. MILES, Editor

Subscription $3.00 per year, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines; in Canada, $4.00; foreign, $5.00—Single Copies, 10 cents

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As the Journal Views It

One Wonders

As we wend our way homeward these days we encounter rare sights. In our youth we labored for a period in a semi civilized country. A vivid recollection is the sight of hundreds of black people being transported from their work on greatly overcrowded flat cars; many of them—women and men and their young—seeming to be clinging by the bare clutch of their finger nails to the swaying train.

To us the sight was horrible. Human beings being transported with the same indifference to their comfort that would be disgraceful even when dealing with animals.

To-day we see similar conditions in the biggest city of our land—only worse. The victims here—white people mostly and of refined and sensitive type—are crowded in the same manner on auto trucks and what not to get to and from their work.

Such sights as these have become frequent. When it is not a street railway with service stopped, it is a steam railway or rapid transit line. And the great mass of humanity must get to and from work, somehow—anyhow.

Strikers are the cause.

When workers in mass in a stockings works demand a higher wage, it does not mean necessarily that humanity must go without socks.

If humanity is willing to pay the increased price, the manufacturer is not greatly concerned how high wages go. He merely passes the increased expense on.

But the utility manager has no such leeway. He can spend just so much and beyond that point it comes out of his stockholders' own pockets and leads inevitably to complete financial collapse.

The great disadvantage of the utility manager in

meeting competition in the labor market is the very inadequate rates his company operates under.

Presumably regulatory bodies in holding down rates do so to save the public money. One wonders just how much the eventual saving amounts to as one views these masses of inconvenienced and endangered travelers to and fro, clinging to their lumbering motor trucks.

They pay fares as high sometimes as a dollar a trip. A few days runs their expense to a considerable sum.

Then there is the loss of productive time, the loss to employers that eventually reflects itself back in increased cost of goods.

Even doubling the street railway company's fare would cost the individual but $30 more in a whole year.

We are numbered among those who believe that labor in a very large number of lines of activity has gotten increases in wage much out of proportion to increased costs of living. But this does not make it possible or even desirable for the utility man to endeavor to hold the lid down tighter than the prevailing scale. If the decorator, the tinner, the plumber, the miner and so on, pays a hundred per cent more it is the height of presumption for the utility man to try to evade by doling out ten per cent more.

But the decorator, the tinner, the plumber, the miner and so on has a come back—the public. The utility man is up against a stone wall.

Consolidating for a Real Gas Business

We haven't been doing a real gas business of late; we've been merely grubbing along.

It appears that the time is near when our minds will again be occupied with thoughts of real business instead of weighted down with worries as to how our companies may continue to exist.

Vacation time is about at an end. Those parts of our forces that we still retain will soon be back in their entirety at their accustomed tasks.

Cooler weather will increase individual vigor and the will to do things.

Once rates are adjusted; once the public has given us the rates that we have declared necessary for adequate service, it will be expected of us that there be prompt response in the way of real gas supply and merchandising.

It is none too soon now to consolidate our forces for real work; to make ready the framework upon which may be built up the new and bigger organizations that will be necessary.

Gas and the Composition and Treatment of Alloys and Eutectics

(*Continued from page* 180.)

as metals expand according to their temperature. And the contraction or shrinkage is also greater in proportion. It is this extra shrinkage which brings out many of the shrinks which occur in the upper half of plates.

In cases of shrinks, chills and severe porousness it is a safe rule to promptly send a pound sample of the metal to some reliable metal works and request an immediate report upon its contents and condition. In many cases the stereotyper can find relief by opening his casting box and removing the scale deposited therein by the action of the solid matter in the water which is used through the cooling apparatus. This incrustation of scale prevents the normal performance of the cooling duties of the water apparatus. Also, those who object to using paper tails can take the metal tail piece and paste a sheet of mat paper upon its back which will give the action and retain the heat as performed by an all paper tail.

The Paper Tail

Occasionally it is difficult to employ a metal tail without getting shrinks, chills or porous plates. In such cases it is customary to resort to the use of a paper tail to which some stereotypers object because of the inconvenience attached to its use. The paper tail will in many such cases give better results because paper is a non-conductor of heat, compared to iron, and it holds the heat in the plate longer, the metal remains liquid longer and the setting is more uniform. Iron, being a natural strong conductor of heat, passes the heat out of the metal and permits the plate to solidify too quickly.

The same effect of heat conductivity is exampled in considering the cause of some cases of porous plates, such as those which come porous with a metal tail and solid when the paper tail is employed. When the metal is taken into the mould, it carries air along with it. The air immediately starts to rise through the liquid metal and escape through the ventage and if the metal does not remain fluid long enough so that the air can pass through it and escape, blow holes will result. By retaining the heat with a paper tail, the metal stays liquid sufficiently long so that the air escapes and the result is more solid plates. Generally the air is caught in greatest quantity near the tail as it has arisen that far before the solidifying metal stopped its progress. For the same reason are all plates usually the most solid at the bottom as the air has had ample time to escape from that portion of the plate.

Although we have thus far assumed that the soft-metal gas-operated furnaces would be melting stereotype metal or some similar alloy, yet aluminum can be handled with such a furnace when a blast burner is adopted. Aluminum melts at about 1,500 deg. Fahr., and a crucible furnace is by no means necessary. As a consequence the use of the usual 1,000-lb. or 2,500-lb. sizes of furnaces with cast-iron pots, either with or without outlets is a simple matter.

To make the needful calculations as to capacity for aluminum in place of those for lead (i. e. 1,000 lb. or 2,500 lb., which are the approximate capacities of standard furnaces in pounds of lead) we may proceed as follows:

The latent heat of fusion = 90 calories per kilogram, or $90 \times 3.96 \times 0.45 = 160$ B.t.u. per lb.

The specific heat = 0.22.

Therefore, $\frac{1{,}400 \times 0.22 \times 1}{160} = 308$ B.t.u.

Latent heat = $\frac{}{468}$, $\frac{468 \times 2}{}$, and assuming 50 per cent

efficiency, we have $\frac{}{600} = 1.55$ cu. ft. of gas per lb. to melt.

The specific gravity of lead = 11.33.

The specific gravity of aluminum = 2.6.

The so-called 1,000-lb. soft-metal furnace pot holds 1,075 lbs. of lead. Therefore let X = the weight of aluminum it will hold.

Then we have: $\frac{1{,}075}{11.33} = \frac{X}{2.6}$. So that $X = \frac{1{,}075 \times 2.6}{11.33} = 248$ lbs. of aluminum.

Again, the so-called ton and a quarter size furnace holds about 2,350 lbs. of lead. So that we have:

$\frac{2{,}350}{11.33} = \frac{X}{2.6}$. Therefore

$X = \frac{2{,}350 \times 2.6}{11.33} = 540$ lbs. of aluminum.

With this explanation the reader will be able to compute for himself the aluminum capacities of any other sizes of furnaces by merely knowing the lead capacities.

As to melting, say, 3,000 lb. of aluminum, $\frac{3{,}000}{540} = 6$ melts on a 2,500-lb. furnace; and, $\frac{3{,}000}{248} = 12$-13 melts on a 1,000-lb. size, which shows the number of melts to take care of 3,000 lb. of aluminum, with either size of furnace.

The application of gas to existing furnaces is something which has received considerable attention in the past and probably it would be difficult to write too much on such a subject.

Whether it pays to convert any appliance to gas or not depends on many factors, the chief of which is the ultimate cost of finished product having in mind the initial cost of the complete equipment.

It would obviously seldom pay to convert a coal-fired candy furnace to gas because the cost of the furnace is so low and the results achieved would so seldom warrant the change.

On the other hand, there is every reason for converting the layer soft-metal furnaces to gas providing the conversion be carried out in a sastisfactory manner. The types of burners to be employed and the methods of applying them are points which can be decided only when all the details are presented.

In the case of stereotype and electrotype furnaces, pyrogenetic burners operated with fan blast have probably been the type used with greatest success, judging from the very large number of installations made all over the country.

Such business, however, pays exceedingly well from every standpoint—namely, load factor, capacity, size of equipment, etc., etc. It is a pity that some gas companies do not seek it more actively than appears to be their custom.

One newspaper equipped with a pyrogenetic burner under the stereotype furnace is worth a whole lot of soldering irons, ranges and other smaller apparatus. It is the kind of business that really pays well. Moreover, although the subject has previously been written on rather fully. It may assist readers if a short recapitulation be given at this point.

Dealing first with the subject of electrotypes:

In making an electrotype, a molding composition consisting mainly of mat with a little graphite or blacklead is poured, when molten, into a shallow metal tray. When it has set its surface is brushed over with powdered graphite and polished.

An impression of the form, which is also graphited, is next taken in the wax while it is still warm (usually by the aid of a hydraulic press) and the mold thus obtained is separated from the form. It next undergoes a process of building up, which consists of dropping heated wax upon those portions which require to be more deeply sunk in the finished type; that is, upon those places where "whites" are to appear in the print. The face of the finished mold is then carefully covered with blacklead, which is a conductor of electricity, and the whole is immersed in an electrotyping bath, where copper is deposited on the blackleaded portions by means of the current from a battery or a dynamo. When the deposit, or shell, is sufficiently thick, it is disengaged from the wax mold, backed with a metal which resembles type metal but contains a larger proportion of lead, and trimmed and planed. For use in rotary presses curved electrotypes may be produced.

Although electrotype (backing up) metal is somewhat similar to stereotype metal yet the furnaces are by no means similar and consequently the types of gas burners employed are entirely different in design.

Figure 1 shows an electrotype furnace which has been converted over to gas, by the aid of atmospheric burners (no blast).

The mold, thus obtained, after being separated from the form is "built up" as already stated by dropping heated wax upon those portions which require to be more deeply sunk in the finished type, that is, upon those places where "whites" are to appear in the point.

The face of the finished mold is then carefully covered with graphite which is a conductor of an electric current and the whole is immersed in an electrotyping bath, where copper is deposited on the blackleaded or graphited portions. When the deposit or shell is sufficiently thick it is disengaged from the wax mold and backed with electrotype metal. This resembbles type metal but contains a larger proportion of lead, usually. It is then trimmed and planed.

Without the ability to make or use these electrotypes, the printing business would be set back many decades. It is clear that the general object is to obtain duplicates of line cuts, half-tone cuts, type matter or other electrotypes, as well as other work with which most readers are familiar and which are sometimes spoken of as "casts."

Stereotyping is a different proposition and by far the more important from the gas man's viewpoint.

The great importance of stereotyping is to do with the printing of newspapers, where printing off of a large number of copies in a short time is essential. For this purpose, in the first place, rotary machines must be employed for almost all the rush work, and stereotyping affords a ready means of obtaining curved printing surfaces to fit their cylinders. It is true that stereotyping is not absolutely necessary for rotary printing, since it has been found possible to print from movable type clamped on the cylinders in curved frames known as "turtles." But to set up duplicate forms of type is impracticable, and, therefore, this device does not permit the utilization of more than one press. Herein lies the second great advantage of stereotyping, for it enables the printer to obtain as many replicas of each form as

he desires, but also to "dress" each of them with several duplicates of the same form, as is required in the later developments of high-speed presses.

The first attempt at making stereotyping was by means of moist clay into which, after it had been impressed with the type and baked, molten type metal was poured; but this method did not yield a curved plate. Later the clay was replaced by "papier-mache," which being flexible can be bent to the required shape. This papier-mache, known as flong and composed of several sheets of paper united by a paste capable of withstanding a high temperature without burning, is moistened and laid over the form of type, into which it is well pressed either by beating with a long-handled brush or, according to the more modern and expeditious method, by being passed through a molding press. The flong is next dried, for which purpose it is either placed with the type in a heated chamber covered with blankets which absorb the moisture, or is removed from the type and heated separately. Sometimes these two methods are used in combination; processes have also been devised for pressing the flong dry upon the type, when subsequent drying becomes unnecessary. For casting a plate the matrix thus prepared is fastened in a casting mold or box curved to the circumference of the cylinder of the press, and molten stereo metal (a softer form of type metal) is poured upon it. During this process the box stands upright, but while the matrix is being placed in position it lies horizontally, a swivel mounting enabling it to be readily turned. After time has been allowed for solidification, the cast is taken out, stripped from the matrix and adjusted on a "finishing saddle," where a machine cuts off the superfluous metal from its upper end and forms a bevel by which it can be clamped on the press. It is then placed face downwards in another machine which shaves out and smooths its interior surface, and finally it is set face upwards, while men with chisels remove protruding pieces of metal that might take ink and print.

Up to the end of the nineteenth century the general method of stereotyping was as outlined above, though of course there were variations in different establishments. The time required to produce a plate, as distinct from making the matrix, was about 1 or 1½ minutes, and the process was expensive in labor since it required the employment of half a dozen men. This time may seem short enough, but when plates are needed by the score, as may be the case with a paper having a large circulation, the delay entailed by the preparation of the whole number by this method becomes of serious importance. Means were therefore sought to reduce it by the adoption of automatic mechanism. In the Autoplate machine invented in America by Henry A. Wise Wood and first used by the New York *Herald* in 1900, the operation of casting is performed automatically from the time the matrix is put in position until the finished plate is ready to be placed on the printing press, and from a single matrix four plates ½ in thick, or seven or eight ¼ in. thick can be produced every minute, by the aid of three men only. The casting is done against a horizontal cylinder or core, the interior of which is cooled by water. Below it is a frame or "back" carrying the matrix. This back has an up and down movement of about 6 in., and when it is in its topmost position there is a semicircular space between it and the core equal in length, breadth and thickness to the plate which has to be cast. Molten metal having been injected into this space by a pump, there is a pause of a few seconds to permit of solidification, and then the back falls, bringing away the matrix with it. Immediately afterwards the cylinder makes a half turn, and presents what was previously its upper half to the matrix for another cast. The first cast is taken with it as it turns and is then pushed along from the top of the core against two rotating saws which trim its edges. Next it comes under a shaving arch, where it pauses while its interior surface is smoothed to proper thickness, and finally water is directed against its back, to cool it without wetting its printing face. The Junior Autoplate is a simpler machine which does not perform so many operations. In it the casting core is vertical, not horizontal, but the matrix is still automatically stripped from the plate, the casts are made alternately on the two halves of the cylinder, and as one plate is being removed another is being cast. The machine also automatically cuts off the sprue which is left on the top of the plate as it stands in the casting box. About three plates a minute are produced, but they are not delivered completely finished, and have to undergo several further operations before they are ready to be placed on the press. The Double Junior consists of two Junior Autoplates served from a common melting pot, and its capacity is six plates a minute, with two matrices; and another machine, the Autoshaver, has been devised which can shave, cool and deliver that number of plates automatically, no labor being required except to take the plate from the casting machine and place it on the Autoshaver.

The sizes of the furnaces run all the way from 1,000 lb. to 10 tons.

In going after this business the gas man need not have before him a mass of figures, in fact it is quite useless to attempt to prove a saving or otherwise for gas as compared with coal. The reason for this is that no two newspapers are the same as to when and how the melt pour and operate generally. The points to emphasize are convenience, utility, speed and durability. It has been good enough for some hundreds of newspapers so far and what it has done for them it will do for all.

In conclusion, the writer feels that no effort should be spared to make metal melting one of the chief loads on the gas company's lines. No matter whether it be stereotype metal melting for the local newspapers or the manufacture of tin foil, collapsible tubes, toys, artistic ware or otherwise, the business is worth all the time that can be put in on it.

The matter of making the installations is simplicity itself. It has been already explained once, but as it is hoped that renewed interest will be taken in this subject, a recapitulation of the details will be given in a subsequent article, it being the writer's belief that it will be appreciated by those readers who are in earnest—and the large majority are.

Four Gassers with Combined Production of 60,000,000 Cu. Ft.

Four gas wells with a daily capacity of 60,000,000 cu. ft. of gas have just been brought in in southwestern Oklahoma. Three of the wells belong to J. A. Hammon. The Empire Gas & Fuel Company has a 10,000,000-foot gasser. J. C. Keys has a good oil well. The Evans test in a section twelve miles east of Lawton, Okla., in a new field has reported an oil well. It is thought it will be good for at least 100 barrels. The Lawton Star Refinery Company sold its refinery to W. G. Black and associates of the Damaskus Manufacturing Company of Cleveland, O., for $150,000.

While Costs of Materials Have Increased as High as 400 Per Cent, Increased Price of Gas to Consumer Has Averaged Only 80 Per Cent

V. S. McIntyre Holds that Adoption of 450 B.t.u. Standard in Canada Has Had Far-Reaching Effect and Will React Toward an International Conservation of Coal and Fuel Oil

Reviewing the events which have affected the gas industry during the past year, and especially those events in which this association has taken an active part, I feel that the lowering by the Government of the calorific standard for gas is one of the most important and progressive moves our association has helped to accomplish, declared V. S. McIntyre in his presidential address before the American Gas Association. The adoption of the 450 B.t.u. standard by our Government has had a far-reaching effect, and will react toward an international conservation of coal and fuel oils, the conservation of which is being found, as time passes, more and more necessary. The question of a more economic standard for gas is also one of the most essential issues engaging the attention of the American Gas Association in the United States, which is, at present, advocating a lower and common standard for every State in the Union.

The shortage of coal and fuel oils, the high cost of same, and the inability to obtain satisfactory contracts and deliveries of these materials, are the most serious problems we have to contend with to-day.

A few weeks ago the executive of our association, believing that the coal situation was far more serious than at any period during the war, forwarded to the Prime Minister of Canada a request for the reappointment of a Dominion Fuel Controller. Since that date the Government has given the Dominion Railway Board wide powers in the controlling of the fuel supply of Canada, and we hope the present conditions will be remedied.

Some method for conserving gas coal and fuel oils will need to be adopted by the American and Canadian Governments in order to insure the continuity of supply and delivery to the gas industry, which can use these materials more efficiently than any other industry, and through the distribution of gas and sale of by-products derived from same, give service to the greatest number.

In speaking of conservation, it might be appropriate to call your attention again at this time to the advisability of increasing, if possible, the efficiency of gas stove ovens, and of educating our consumers to more efficient operation of gas stove cooking tops. This latter applies more directly to smaller companies, as most of our larger gas companies have advertising and publicity departments and are conducting campaigns of this kind.

The demand for gas is increasing and will increase very greatly in Western Ontario during the coming two years, on account of the shortage of electricity, the sale of which for heating and cooking purposes will be very limited, and has already been prohibited in most of the municipalities on the Niagara hydro system. The gradual depletion of the supply of natural gas will also cause a demand for the manufactured article.

Notwithstanding all of the difficulties we have had to contend with it is my opinion that the gas industry should be congratulated on the remarkable showing they have made during the past year or two as regards the rates in effect for the sale of gas. While the costs of materials required in the production of gas have increased, in many cases as high as 400 per cent, the increased price of same to the consumers has averaged only 80 per cent. In fact, many gas companies in the United States and Canada have increased their rate only high enough to keep their plants in operation until normal conditions return.

The association is to be congratulated on the interest that is being taken and the information that is being given out for the benefit of all our members through the "Question Box" in the *Gas Journal*. This department of our association is now becoming of general interest to every gas man in Canada. It is also gratifying to note the increase in our membership. During the past year we have had a net gain of 15 members, bringing the total membership to date to 116.

Our finances are also in good condition, and, while the association has been called upon very considerably during the past year, owing largely to heavy expenses incurred at our last convention, we still have a balance on the right side of the ledger.

I would also like to congratulate our Papers Committee on the splendid and instructive papers they have prepared to be read at this session. The Entertainment Committee has also spared no pains in preparing a program for our benefit.

There are before each gas man to-day so many very important matters that one might speak of, but which, on account of our limited time, it is impossible to present to you this morning, that I shall close with a brief quotation from an address by Mr. Cortelyou, president of the American Gas Association, given at their first convention in October last. This quotation, I feel, is very appropriate at the present moment, and should be taken to heart by each gas man to-day. Mr. Cortelyou spoke as follows:

"The spirit of efficient service must be encouraged and every one in the gas industry must be made to feel that he is engaged in an honorable calling and that the future holds possibilities of permanency and advancement. Co-operation in the fullest measure, of course, but in every office and plant and workshop there must be inducement to individual effort and individual initiative. That should be the way of the gas industry, and if this association can contribute substantially in effort and enthusiasm, in research and results, to so shaping the industry's progress, it will deserve well of those in whose service it is engaged."

Large Attendance Expected at Annual Convention of Pacific Coast Gas Association

Committee to Make Report on Their Investigations of the B.t.u. Problem—Programs of Papers Up to Date

Men of the gas industry from all parts of the Pacific Coast are making preparations to attend the annual convention of the Pacific Coast Gas Association which will be held this year in Portland during the third week in September.

There are several matters of up-to-date interest which will occupy the convention in its deliberations. Last year, it will be remembered, our brethren of the gas industry met in Los Angeles, and there two matters of more than ordinary importance were taken up. One was the proposed affiliation of our association with the American Gas Association, the parent organization whose headquarters are in the East. This affiliation was favorably considered and the consensus of opinion is that the step so taken was a wise one. Gas has come into its own of recent years. While having to compete to its advantage, perhaps, with its more generally favored younger rival, electricity, for lighting purposes, it is conceded to leave that rival very far behind when it comes to a question of availability as well as efficiency as a house heating agent and an industrial fuel. In fact, in the two last named uses gas has made enormous strides of late so that the gas men need no longer bear the taunt so often leveled at them in the past by their electrical rivals that they were behind hand in the invention and manufacture of appliances to encourage a more diversified use of the older product.

Another matter that receixed general attention at Los Angeles was the proposed investigation by the California State Railroad Commission, in co-operation with representatives of the gas industry, of the much disputed B.t.u. problem. It was announced at the time that experiments conducted in England and elsewhere had tended to upset all previously established theories, and the investigation was entered upon with the idea of thoroughly testing out this problem from every conceivable standpoint and under varied conditions, in order that it might be determined, once and for all, what thermal unit standard should be definitely accepted as being the best for the manufacturer and consumer. This investigation is now in progress, and it is not expected that a decision will be reached before a year or more. Nevertheless, progress will certainly be reported at the forthcoming convention, and this alone should make it worth while for every available member of our association to undertake the trip to the Rose City.

A circular letter announcing arrangements for the convention will shortly be sent out by Secretary Henry Bostwick from headquarters in San Francisco. In this a program of papers to be read and discussed at the convention will be given. This program as made, up to date, is as follows:

President's address—A. B. Day.

1. Production, Transmission and Distribution of Natural Gas—A. B. Macbeth.
2. The Use of Governors and Regulators in Gas Distribution—W. M. Henderson.
3. Advantages of Gas Fuel in the Heat Treatment of Metals—R. G. Logue.
4. Policy of the Management in the Sale of Gas—D. J. Young.
5. Oil Gas—W. S. Yard.
6. Standardization of Procedure and Records in the Service of Gas to Consumers—W. H. Barton.
7. Advertising the Gas Business—J. H. Hartog.
8. Temperature—Its Measurement and Control in the Gas Industry—S. F. Andursky.
9. Wrinkles—F. E. Bivens.
10. Experiences—John Clements.

In view of the impending advance in railroad fares it is pleasant to be able to announce that the Southern Pacific Company has offered members of the convention special return rates of one and one-half fares, provided there is a minimum attendance of 100 paying fare by rail on going trip of $1 or more.

Mr. W. M. Kapus, of the Northwest Gas & Electric Equipment Company, is the convention's representative at Portland to take care of all hotel reservations. He has already secured special rates on the European plan at the three leading hotels, the Multomah, the Portland and the Benson.

The Entertainment Committee, under the leadership of Mr. Guy W. Talbot, has arranged a most attractive program, both for members and their wives. This includes drives, golf, luncheon, a dance and the annual banquet. Last, but not least, an outing on the Columbia River Highway, one of the scenic splendors of the United States.

Now, brethren of the P. C. G. A., get busy! Don't find reasons for not going to Portland, but see that you go whether you think you are able to or not.

Taking Capacity of Gas Well by Open-Flow Method Wastes Millions of Ft. Per Year

By way of conserving the supply of natural gas in every way possible, suggestion has been made to the Corporation Commission by F. L. Chase, manager of the gas department of the Lone Star Gas Company of Dallas, Texas, relative to the manner in which the capacity of a gas well is taken by the open flow. Under a rule of the commission a certain per cent of the capacity of a gas well must be taken and the amount is estimated by the open flow of the well. The process is wasteful, in the opinion of Mr. Chase, and of this he says:

"I have just been making an estimated figure on the loss of gas that occurs by reason of the requirement for taking the open flow of all gas wells every month. Our estimate is that this causes a loss in our wells alone of 25,000,000 to 30,000,000 ft. of gas a month, or something like 300,000,000 ft. a year. This gas has an economic value of 40 to 50 cents for 1,000 ft., which results in an economic loss of $125,000 to $150,000 a year.

"So long as the Oklahoma commission restricts the output of a well to a percentage of the open flow capacity, it would, of course, be necessary. But it occurred to me that a close and accurate measurement of the open flow of a well is not absolutely necessary; that an approximate figure for the capacity of the well could very easily be arrived at by the use of minute pressures, under such rules as the commission might formulate. Arriving at the capacity of a well in this manner, it seems to me, would answer the purpose of the commission and would avoid this enormous loss of gas, which must amount, throughout the entire State of Oklahoma, to hundreds of thousands of dollars a year."

NEWS OF THE GAS INDUSTRY

C. S. Bagg, of Montreal, Elected President Canadian Gas Association

Meeting Held in Ottawa, Canada, August 27 and 28 Proves to Be One of the Best and Most Profitable Conventions of Recent Years—Retiring President McIntyre Strikes an Optimistic Note

Once more the Canadian Gas Association lives up to its good name as the Association of successful conventions, for the thirteenth annual meeting just recently concluded at Ottawa, Canada, Aug. 27 and 28, turns out to be not a whit behind any preceding gatherings, excepting perhaps the not-to-be-forgotten combination meeting of the Michigan and Canadian associations at Toronto, some few years ago. The attendance was somewhat slimmer but other things made up for it.

Delegates began arriving early and quite a few came via special Pullman from Toronto, and by the time of the opening session, 10 A. M. Friday, a fair number were in attendance. The ladies also were quite in evidence, no doubt appreciating former meetings, when splendid programs were arranged for their especial benefit, and they looked for another one equally as good at this one, nor were they disappointed.

Only two business sessions were held, but every minute was full of good things for the gas man interested in the future development of the industry. Excellent papers had been prepared, some of which dealt especially with the calorific value of gas, a subject pretty much on every gas man's tongue nowadays.

Retiring President McIntyre's address, published elsewhere in this issue of the JOURNAL, was received with much applause. He stated in part that the lowering by the Canadian Government of the calorific standard for artificial gas was one of the most important and progressive moves the association had helped to accomplish. The adoption of the 450 minimum B.t.u. standard by the Government has had a far-reaching effect, and will react toward an international conservation of coal and fuel oils, the conservation of which is being found as time passes, more and more necessary.

He further stated, "The shortage of coal and fuel oils, the high cost of same, and the inability to obtain satisfactory contracts and deliveries of these materials, are the most serious problems we have to contend with to-day."

Mr. McIntyre pointed out the value of the artificial gas industry to mankind stating to the effect that sooner or later the solution of the fuel question would surround the gas industry. Although Mr. McIntyre is chiefly an electrical man, still his deductions prove that the demand for gas will increase very greatly during the coming two years, on account of the shortage of electricity. This is worthy of note. He states that the sale of electricity for heating and cooking purposes will be very limited, and has already been prohibited in most of the municipalities on the Niagara hydro system. This ought to encourage the faint-hearted gas man and renew his hopes.

The executive committee held a short meeting prior to the opening of the regular session and received the principal items of business taken care of during the past year.

Sharply at 10 A. M. the first general session was called to order by the president. The reading of the minutes, executive committee's report, secretary-treasurer's report and the retiring president's address followed.

The secretary-treasurer's report showed a favorable balance to the credit of the association, notwith-

CANADIAN GAS ASSOCIATION MEETING, OTTAWA, CANADA

standing an extra heavy financial year in the way of expenses generally. New members to the number or fifteen or so, enrolled during the year proved renewed interest in the work of the association and Secretary Allen was highly commended on his loyalty and devotion to the interests of the industry.

The Nominating Committee for the election of office bearers for 1920-21 was at this point elected and at the second morning session brought in the following slate, which on presentation to the members was unanimously adopted:

For president—C. S. Bagg, secretary-treasurer, Montreal Light, Heat & Power Company, Montreal.

For vice-president—E. H. Caughell, Light and Power Department, St. Thomas, Ont.

Second vice-president—Col. D. R. Street, secretary-treasurer, Ottawa Gas Company, Ottawa, Ont.

Secretary-treasurer—G. W. Allen, advisory manager and employment superintendent of the Consumers' Gas Company, Toronto.

Executive Committee, consisting of eight members as follows:

Arthur Hewitt, general manager, Consumers' Gas Company, Toronto.

C. A. Jefferis, superintendent of gas manufacture, Consumers' Gas Company, Toronto.

J. S. Morris, vice-president, Montreal Light, Heat & Power Company.

C. C. Folger, general manager, Kingston Light, Heat & Power Company, Kingston, Ont.

J. P. King, manager, Stratford Gas Company, Stratford, Ont.

J. M. H. Young, superintendent, City Gas Company, London, Ont.

A. A. Dion, general manager, Ottawa Gas Company, Ottawa, Ont.

V. S. McIntyre, superintendent, Light & Power Department, Kitchener, Ont.

The representatives elected to serve on the various managing committees of the American Gas Association were left to the decision of the Executive Committee. The present names are:

Accounting section—J. J. Armstrong, Toronto.

Technical section—J. J. Humphries, Montreal.

Advertising section—G. W. Allen, Toronto.

Manufacturing section—W. R. Gibson, Toronto.

Commercial section—To be named.

The balance of both morning sessions was taken with the reading and discussion of the various papers.

A paper, entitled "Chemical Control as an Aid to Reducing Present Day Abnormal Manufacturing Casts," by F. J. Kennedy, engineer, West's Gas Improvement Company, Manchester, England, proved to be a very timely one, dealing as it did with the production of gases of lower calorific value, yet which in the final analysis would prove the salvation of the country's fuel difficulties and tend to give light, heat, fuel and power to the thousands and millions, now beginning to feel the pinch of the fuel shortage.

"Underwater Pipes" was the title of a paper prepared by D. L. Hill, distribution department of the Consumers' Gas Company, of Toronto. His paper was a good one on the difficulties to be overcome in submarine gas pipe laying. It is one of the very few papers on this subject.

How the Halifax (Nova Scotia) Gas Company took hold of its sulphur problems was ably laid bare in an excellent paper by Mr. E. R. Hamilton, superintendent of the Gas Department at Halifax. Mr. Hamilton's paper is entitled, "The Sulphur Problem at Halifax." Handling high-sulphur content coal is a big problem at Halifax, but this paper shows how well this work was taken care of.

B. B. Saul, chemist of the gas department, Montreal Light, Heat & Power Company, Montreal, read a valuable paper on "Storage of Coal," which, besides being timely, is of value to all gas men having difficulty with this question.

The commercial man couldn't help but be interested in M. L. Kane's paper entitled "How Should 'New Business' Be Viewed To-day?" Mr. Kane is a well-known authority on new business methods, having had experience for many years as manager of the sales departments of a number of gas companies. He is now manager of the gas department of the Winnipeg (Canada) Electric Railway Company. His paper is more or less a digest of present day thought on the advisability of taking on new business under present conditions. He doesn't advocate big strides in new business development, but rather tends to interest gas men in the work of keeping close watch on the business while passing through this present crisis, so that when times become more favorable the industry will be on a solid footing. Mr. Kane was not able to personally deliver his paper but it was given out for perusal by members.

Our old friend, "Bob" Wallace, superintendent gas department, Quebec Railway, Light & Power Company, seems to keep his hand in on the paper-preparing question, for we note with pleasure his paper entitled "Gas Works Expedients," which was read at this meeting. Mr. Wallace always has some new wrinkles to show to interested gas men and this one brings out a number of good points of value to gas men when in difficult situations around a gas plant.

No manager of a gas plant should fail to read Mr. A. A. Dion's paper entitled "Carrying On Against Highly Adverse Conditions by Means of Improved Plant and Equipment." Mr. Dion is general manager of the Ottawa Gas Company, Ottawa, Canada, and is well qualified to speak on this timely subject. Not many gas managers have had to go through as strenuous times as has our friend Dion, but his paper ably proves what new plant and equipment can do to enable a company to pull through even the worst of fuel crises. In any event, it shows how the Ottawa Company did the trick.

All the papers were received with enthusiasm and evoked considerable discussion.

The entertainment features were excellent and included auto drives Friday afternoon, under the auspices of the local Rotary and Kiwani's Clubs and which also included a visit to the Canadian Government experimental farm, where refreshments were served.

The banquet was a real success. It being of an informal character made it easy for a number of the younger and more timid gas men to come forward and thoroughly enjoy themselves. The dinner was held in the Chateau Laurier Hotel 7 P. M. Friday. Immediately after the banquet informal dancing was indulged in on the Century Roof Garden, Jackson Building, a short distance from the hotel. Needless to say, all these features were thoroughly entered into by most of the delegates and a real pleasant time was passed by all.

At 9 A. M. Saturday, the delegates resorted to a near-by moving picture theater, to see the 2,000 ft. film run off illustrating the Koppers

Company coke oven plants in operation. This feature was well worth seeing and those who availed themselves of the opportunity of doing so will never regret the educational phase of the whole proceedings. Mr. E. L. Crowe, of the Koppers Company, was on hand to explain the process.

Saturday afternoon was taken up by visits to various points of interest around Ottawa.

Striking Miners Close Down Industrial Coal Mines for Three Days—Gas Plants Facing Shut-Down

Once again has the coal shortage specter alighted in Indiana. Aug. 19, just after the coal situation apparently had been adjusted to a point where production should have started again, the "day men" in practically all Indiana mines refused to work pending adjustment of their wages. Without the "day men" at work the real miners cannot operate. Thus, with the fuel shortage ahead forming one of the most far-reaching problems that the country generally ever has faced, Indiana mines were idle for at least three days again.

Coincidently with this newest stoppage of coal production, State officials in Indiana again set before the people of the State the dire problem that confronts the utilities of the State for next winter. Utilities, with a shortage of railroad cars having interfered with practically any bulk deliveries during the summer, have failed in almost every instance to build up any considerable reserves and their representatives are extremely active throughout the Hoosier coal fields in an effort to obtain coal.

Some have supplies of coal sufficient only to operate a few days. Gas plants, traction lines, water works and electric light and power plants are suffering far beyond the knowledge of the general public and it is not exaggeration to say that next winter apparently is to witness the closing down of many utilities in Indiana because of fuel shortage, even though herculean efforts are made to solve the coal problem at once. The wisest statesmen in Indiana do not see how intense suffering is to be avoided during the coming winter. Dispatches from all over the coal fields in Indiana late last week told of the idleness of practically all mines. It was hoped the immediate question at issue between the operators and the "day men" would be settled early this week so that at least that stumbling block to coal production would be removed at once.

The Hoosier newspapers all "played up" the order of the miners' officials, which sought to send them back to work pending settlement of their disagreement. The order read:

"We have arranged with coal operators of Indiana for conference at 10 o'clock Tuesday morning of joint district scale committee to adjust any inequalities existing in the wage scale between tonnage and day labor. We are ordering all members of our local unions where idle to return to work immediately and those already working to remain at work. We assure you this question will be properly handled and adjusted Tuesday. The Indiana operators were to meet separately before the joint meeting to plan what they should do. Meanwhile the utility managers of Indiana waited breathlessly the latest developments of this new coal tangle.

Only twenty-five of the 225 mines in Indiana were reported at work last Saturday, in reports received at the Indiana Coal Trade Bureau at Terre Haute and the reports said that Hoosier cities and towns were facing a fuel shortage, which was to grow more serious hourly. The refusal of the day men to report followed adjournment of a joint conference of mine representatives and operators at Cleveland last Wednesday, without arriving at a new pay scale for the central competitive district, composed of Ohio, Indiana, Illinois and western Pennsylvania. The day men compose but approximately 27 per cent of the total mine forces, but the nature of their work is such that they can stop practically all operation at the shafts. They are asking for an increase from $6 to $8 a day for an eight-hour day, contending that they are not paid proportionately to what pick men inside the shafts receive.

Speaking of the failure of the conference to agree at Cleveland and of the abolition of the central competitive mining field as a wage fixing unit—another development of the Cleveland conference — Phil H. Penna, secretary-treasurer of the Indiana operators, characterized the results of the conference as a "farce." He laid the blame for the failure to agree on the Illinois miners, saying that the Illinois miners knew that the Illinois operators were willing to pay more than 71.4 cents a day increase, which was proposed and which would have equalized the increase recently given all miners by the Federal coal-regulating body.

"The operators and miners of the central competitive field," said Mr. Penna, "met at Cleveland in compliance with a request by President Wilson for the purpose of considering any inequalities that may have occurred in the award of the bituminous coal commission and the joint agreement growing out of the same. We were advised by Attorney General Palmer that we were well within the law meeting to do what the President requested, but nothing further. The alleged inequality, of which the mine workers complain, was that the men in and around the mines who are paid by the month or day had not been awarded by the commission an equal per cent of increase in their wages.

"The operators agreed to correct the inequality complained of, which amounted to 71.4 cents to the day men and the monthly men, and it is my opinion that a settlement on this basis was prevented by the fact that the Illinois coal miners' representatives knew the Illinois coal operators were willing to pay more."

And meanwhile the gas and other utility properties in Indiana are pursuing the old "hand-to-mouth" policy of using up all the coal in their bins to-day, under the extreme hope that somehow, some way, a carload may find its way down the track for to-morrow's purposes. And slowly the Indiana public is coming to realize that even the dire days of the war did not hold the promise of suffering that next winter now holds out to them. Members of the Public Service Commission of Indiana this week reiterated to the Indiana public generally that it is helpless in the situation and that unless State and Federal Governments act swiftly to relieve the coal condition, there is no telling what actually will happen this fall and winter.

Dispatches from many cities early this week told of the closing down of factories, utilities and other coal-using properties. A gas utility at Washington, Ind., faced shutting down completely early this week because of the shortage. The dispatch said that newspapers, bakeries, restaurants, hotels and 1100 homes would be affected by the shutdown of the gas company. Similar conditions already were threatening elsewhere.

Bureau of Standards Investigates Gas Appliances as to Natural Gas Conservation

The Bureau of Standards, Washington, D. C., in the latest issue of its technical news bulletin, makes the following comment on investigations which are being conducted there with reference to gas appliances in an effort to determine the most economic use of gas as a step in the way of conservation of natural gas, which great natural resource is said by government experts and others to be on the decline.

The investigation of gas-burner design and operation begun last year in co-operation with the Industrial Fuel Committee of the American Gas Association has been continued actively throughout the year. This work is an essential preliminary to investigations which have been in mind for several years, looking toward increased efficiency in the use of gas. The proper design of air shutter, gas orifice and burner throat to give the maximum injection of air under ordinary conditions was the part of the problem particularly assigned to the bureau. Some months were spent in designing and developing suitable apparatus for making the necessary measurements of the air and gas, but the time thus spent was well worth while, as the equipment developed proved so satisfactory that results have been obtained with unusual rapidity. This work has been done on experimental burners representing a wide variation in dimensions. An extended report of the results so far obtained was presented to the Industrial Fuel Committee in June.

This report covered primary work in connection with industrial burners, but the urgent need for conservation of natural gas and for improvement in natural gas service as supplied to households suggested the desirability of extending this investigation to the types of domestic burners used with that gas. Since transportation of sufficient quantities of gas to Washington was not practicable, the Bureau of Mines kindly furnished space in its Pittsburgh experiment station, and during the past month experiments were begun there to find what range of efficiency is actually obtained in the use of natural gas and what degree of improvement is practicable. This work has already progressed far enough to show that many appliances as used are very low in efficiency and that great improvement in this respect can readily be made. Specific tests, for example, have shown that equipment which now makes use of only 10 to 30 per cent of the heat of the gas can be made to use 30 to 50 per cent. Such increases in efficiency, if generally obtained, would be equivalent to doubling the supply of gas available.

Results of great importance have also been obtained in the design of natural gas burners to operate on low pressures.

It is a common experience that in very cold weather the gas pressure falls for various reasons so that the usual gas appliances become practically useless. This investigation has shown that burners can be so designed as to operate well on natural gas at low pressures such as are used with manufactured gas; and it is possible that an improvement in service might be made by installing regulators which would supply gas at a low and uniform pressure. The adoption of this plan, however, would require considerable changes in gas distribution systems valued at millions of dollars, and before it could be definitely recommended extensive engineering studies would be required.

Quarterly Report of Baltimore G. & E. Company

A statement filed with the Public Service Commission by the Gas & Electric Company, Baltimore, Md., showed that in the three months ending June 30 the company increased its net surplus $231,426.59, as compared with the same period last year, and that in the six months ending June 30 the increase was somewhat smaller—$201,654.01—as compared with the same six months of 1919.

For the six months period the company earned gross $7,613,211.24, and its operating expenses and taxes were $4,856,229.66, leaving a net revenue of $2,756,981.58. Fixed charges of $1,198,307.08 reduced the balance to $1,558,674.50, which was available for depreciation and dividends. Payments of $548,151.21 to the depreciation account and of $584,296.80 to dividends left $426,226.49 which was available for surplus and for contingencies.

The sum available for surplus and contingencies in the six months ending June 30, 1919, was $224,572.48.

To Erect Addition to Gas Plant

Work will start soon on the erection of an addition to the Moline Power Company's plant at Moline, Ill. The company will erect a two-story addition, install a 100-ton scale and build a concrete purifying tank for gas. The work will cost in the neighborhood of $20.000.

First Quarterly Report of Federal Trade Commission

The Federal Trade Commission has just issued it first quarterly report on revised costs of producing bituminous coal, supplementing preliminary monthly bulletins of reported costs already issued. The information covers the first quarter of 1920 and shows the average sales realizations and revised costs of 1,156 operators producing about 36 per cent of the total bituminous coal production of the United States during that period, as estimated by the Geological Survey. While the whole of the industry, therefore, is not covered by the operators reporting to the commission, it is believed that the results shown are fairly representative of the industry. The revision of costs for all districts shows an average reduction from reported costs of 6 cents per ton.

The figures cover only the first three months of the year (with comparisons with 1918) and are not to be taken as indicative of present conditions. No figures of present sales realizations and costs are available. The latest published data are found in the commission's Bulletin No. 4 for April, 1920, issued July 26.

The average sales realization of the 1,156 operators in the first quarter of 1920 was $2.74 per ton and their revised f.o.b. mine cost was $2.31 per ton. Of this cost, $1.76 per ton represented labor; 25 cents, supplies; and 30 cents, general expense (or overhead). The difference between the sales realization and the total f.o.b. mine cost is the "margin," which averaged 43 cents per ton. This "margin" is not the same as profit. "In order to arrive at the amount available for income and excess profits taxes, dividends, or surplus there must be deducted certain items, such as selling expenses and interest on borrowed capital, and there must be added certain items, such as income from outside investments."

These average figures for companies in all parts of the country

should not be considered applicable to any one region or district because of marked variations in costs, and in sales realizations, due to quality of the coal and market conditions. Thus the highest regional cost for labor was nearly a dollar a ton more than in the region having the lowest labor cost. Labor cost in the Central Competitive "Interstate" Region (which produced 45 per cent of the total tonnage of the 1,156 operators) was 17 cents per ton below the average labor cost ($1.75 per ton); and in the Southwestern "Interstate" Region (which produced 5 per cent of the total tonnage) was 77 cents per ton above the average. Average sales realizations by regions ranged from $2.44 per ton in the Central Competitive "Interstate" Region to $3.52 per ton in the Southwestern "Interstate" Region.

By districts, within the six major regions, the report shows that 24 districts producing 8,664,817 tons had an average margin of 27 cents per ton or 16 cents per ton *below* the average margin of the 1,156 operators (43 cents) for the United States as a whole. In 19 districts, producing 9,676,785 tons, the margins realized averaged 67 cents per ton or 24 cents *above* the average for the United States. The remaining 29 districts produced 30,000,000 tons at an average margin of 42 cents per ton.

For comparison with the year 1918 the report gives data for 884 identical operators reporting in both periods. The sales realizations of the 884 operators was 15 cents higher in the first three months of 1920 than in 1918, but their total f.o.b. mine cost increased 28 cents per ton (14 per cent) so that their margin declined from 60 cents per ton in 1918 to 47 cents in the first quarter of 1920. Their increase of 14 per cent in total cost is attributable in small part to a 6 per cent decline in their production but is chiefly due to the increase in the wages of 14 per cent effective in November, 1919, and in force throughout the first quarter of 1920.

For the entire 1,156 operators the average sales realizations, total revised f.o.b. mine costs and margins per ton of 2,000 lbs. for the first quarter of 1920 are shown by States and districts as follows, together with the number of operators reporting in each district.

FIRST QUARTER 1920

The State and District	No. of Operators	Sales Realization	Revised f.o.b. Cost	Margin (1)
Alabama				
No. 1 (Big Seam)	13	$2.79	$2.44	$0.35
No. 2 (Cahaba)	16	4.04	3.48	.56
No. 3 (Pratt)	21	3.01	2.46	.55
No. 4	3	3.74	3.06	.68
Total	53	$3.17	$2.61	$0.56
Arkansas				
Sebastian	11	$3.58	$3.29	$0.29
Excelsior-Logan	5	4.92	4.98	†.06
Anthracite	6	6.40	5.98	.42
Total	22	$4.60	$4.31	$0.29
Colorado				
Domestic	23	$3.36	$2.69	$0.67
Trinidad	8	2.86	2.64	.22
Lignite	9	2.63	2.24	.39
Total	40	$3.08	$2.58	$0.50
Illinois				
Number 1	12	$3.20	$2.88	$0.32
Number 2	13	2.69	2.26	.43
Number 3	19	2.27	1.96	.31
Number 4	41	2.24	1.85	.39
Number 5	2	2.78	2.43	.35
Number 6	16	2.37	1.98	.39
Total	103	$2.36	$2.00	$0.36
Indiana				
Number 1	57	$2.41	$2.00	$0.41
Brazil Block	5	2.47	2.24	.23
Total	62	$2.41	$2.01	$0.40
Iowa				
Marion-Monroe-Polk	17	$3.18	$2.65	$0.53
Appanoose-Boone	14	3.75	3.13	.62
Total	31	$3.32	$2.78	$0.54
Kansas				
Cherokee-Crawford	21	$3.25	$2.83	$0.42
Osage-Leavenworth	1	5.03	4.75	.28
Total	22	$3.27	$2.86	$0.41
Kentucky				
Number 1	37	$2.33	$1.93	$0.40
Number 2	27	2.64	2.51	.13
Number 3	60	2.93	2.48	.45
Number 4	3	2.68	2.09	.59
Total	127	$2.59	$2.23	$0.36
Maryland (State)§	22	$2.94	$2.55	$0.39
Michigan (State)*	2	$5.45	$4.75	$0.70

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The State and District	No. of Operators	Sales Realization	Revised f.o.b. Cost	Margin (1)
North Dakota				
Southern	1	$2.66	$2.40	$0.26
Northern	2	3.05	2.85	.20
Total	3	$2.72	$2.46	$0.26
Ohio				
Number 1*	2	$2.68	$2.24	$0.44
Number 2	15	3.21	2.67	.54
Number 3*	11	2.43	2.27	.16
Number 3a*	2	2.89	2.64	.25
Number 4	13	2.45	2.29	.16
Number 5	4	2.67	2.93	†.26
Number 6	17	2.81	2.48	.33
Number 7	5	3.15	2.28	.87
Number 8	25	2.55	2.14	.41
Number 9	9	2.41	2.11	.30
Total	103	$2.57	$2.23	$0.34
Oklahoma				
McAlester Vein	4	$4.79	$4.49	$0.30
Eastern	29	3.97	3.48	.49
Total	33	$4.05	$3.59	$0.46
Pennsylvania				
Southwest	70	$2.50	$2.13	$0.37
Central	198	2.93	2.56	.37
Total	268	$2.71	$2.28	$0.43
Tennessee				
Number 1	22	$2.95	$2.57	$0.38
Number 2	3	2.69	2.33	.36
Blue Gem	7	3.52	3.31	.21
Total	32	$2.97	$2.61	$0.36
Texas				
Bituminous	4	$4.65	$4.79	†$0.14
Lignite	16	1.61	1.46	.15
Total	20	$2.13	$2.02	$0.11
West Virginia				
Pocahontas	10	$2.63	$1.89	$0.74
Tug River*	1	3.38	2.83	.55
Thacker*	1	2.83	2.44	.39
Kenova	2	2.99	2.78	.21
Logan	13	2.74	2.07	.67
New River	24	2.96	2.44	.52
Kanawha	30	2.74	2.22	.52
No. 10, Coal & Coke and Gauley	19	2.56	2.20	.36
Fairmont*	14	2.54	2.33	.21
Pittsburgh Seam	5	2.71	2.09	.62
Total	119	$2.72	$2.14	$0.58
Wyoming (State)	12	$2.70	$2.23	$0.47
United States	1,156	$2.74	$2.31	$0.43

(1) "Margin" is not the same as profit. (See above.)

(†) Amount by which total f.o.b. cost exceeded sales realization.

(§) Includes Upper Potomac, Cumberland and Piedmont District of Maryland and West Virginia.

(*) Reported tonnage very small compared with total tonnage in district.

Washington Gas Light Asks Extension of Present Rate

The Washington Gas Light Company, Washington, D. C., has filed with the Public Service Utilities Commission a petition asking for a continuation of existing rates during September and October, or for higher rates if the commission should find they are justified by the present costs of furnishing gas. The petition applies also to the Georgetown company.

The present rates are: For 100,000 cu. ft. or less, $1.25 per thousand; from 100,000 to 300,000 cu. ft., $1.20 per thousand; from 300,000 to 500,000 cu. ft., $1.15; from 500,000 to 750,000 cu. ft., $1.10; from 750,000 to 1,000,000 cu. ft., $1.05; in excess of 1,000,000 cu. ft., $1 per thousand.

Consumers in private homes pay the $1.25 rate, the lower rates being intended for large wholesale users. The existing rates expire automatically Sept. 1, which will make it necessary for the Public Utilities Commission to hold hearings within the next ten or fifteen days.

The Utilities Commission based the existing rates on the ground that the company should be allowed a return of 7 per cent on fair value.

The effect which the increased freight rates will have on the cost of coal used for making gas will be discussed, in all probability, at the hearings on the gas rates.

The gas company uses approximately 80,000 tons of coal annually and it is roughly estimated that the price of the coal will be about 90 cents a ton higher as a result of the freight rates.

Officials of the gas company said that it is their intention to lay before the commission all the facts they can gather as to the costs of operation and let the commission decide whether they should be increased.

Texas Company Buys Natural Gas

The Texas Company of Houston, the largest producer of crude petroleum in Texas, is preparing to enter the natural gas industry. It has entered into a contract with the Burk-Kirby Oil Company, near Eastland, by which it agrees to purchase a minimum of 165,000,000 cu. ft. a month from its two wells near here. The Texas Company plans to pipe this fuel to Eastland, Cisco, Baird, Abilene and other towns for domestic and industrial purposes.